

# **2013 Bird Surveys on Spotted Dog WMA:**

## ***Baseline information on the bird community***



**Including bird surveys at:**

**Blue-eyed Nellie WMA, Stuart Mill Bay Fishing Access, & the Milltown Dam Recovery Area**

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**<http://cfc.umt.edu/ASC>**

## **Executive Summary**

In 2013 the Avian Science Center (ASC) was approached by Montana Fish Wildlife and Parks (FWP) and the Natural Resource Damage Program to conduct bird surveys across Spotted Dog WMA. When the ASC conducted extensive surveys throughout the Upper Clark Fork River Basin in 2009 to obtain baseline information, the Spotted Dog property was privately owned and the landowner did not allow access for bird surveys. FWP was therefore lacking detailed information on bird community composition, abundance, and habitat associations on this important acquisition. A small survey effort was also undertaken at three other sites in the Upper Clark Fork River Basin: Stuart Mill Bay FAS, Blue-eyed Nellie WMA, and the Milltown Dam recovery area. Baseline information on the bird communities in these properties will help managers assess habitat condition and may inform land management practices.

A majority of the survey effort (90%) took place on Spotted Dog WMA. In order to survey bird communities in all habitat types represented on the property we used a combination of spatially balanced sampling, which distributed surveys in proportion to the available habitat, and targeted sampling to adequately sample riparian habitats. The survey design for spatially balanced sampling followed the GRTS design employed by a large, regional monitoring program implanted in parts of 13 western states, including Montana, – Integrated Monitoring by Bird Conservation Region (IMBCR). By using the IMBCR design we have the potential to leverage off this larger program to produce density estimates and compare bird communities at the WMA scale to those at state and regional levels.

One technician, Tyler Clarke completed bird and vegetation surveys on the Spotted Dog WMA, Blue-eyed Nellie WMA, Stuart Mill Bay FAS, and the Milltown Dam recovery area. Birds were surveyed using the IMBCR point count survey protocol in which a distance is recorded to all birds seen or heard within a six minute count period. The technician also assessed the vegetation within 50 m of the point, assigning each point a primary habitat type and estimating the percent coverage and species composition in different vegetation layers including canopy, shrub, and ground cover.

T Clarke surveyed 308 points across 30 transects between 30 May and July 12. There were 2803 bird detections representing 86 species and 2933 individuals. Four species were encountered only while walking between point count stations and six SOC species were detected: Common Loon, Great Blue Heron, Northern Goshawk, Long-billed Curlew (7), Clark's Nutcracker (113), and Brewer's Sparrow (14). Relative abundance differed significantly ( $p \leq 0.05$ ) among habitat types for most species; while this is unsurprising, it underscores the importance of understanding bird-habitat relationships.

Bird community diversity was relatively low in some habitat types. For example shrubland communities lacking dense sagebrush cover also lacked Brewer's Sparrow; grassland habitats were dominated by Vesper Sparrow and Western Meadowlark. Bird abundance was also higher in riparian patches  $\geq 40$  m wide than narrow stringers of riparian habitat. This information could be used by managers to target habitat restoration efforts on the WMA and birds could be used as a tool to evaluate changes in habitat structure over time.

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## **INTRODUCTION**

The Avian Science Center (ASC) was approached by Montana Fish Wildlife and Parks (FWP) and the Natural Resource Damage Program to conduct bird surveys across Spotted Dog WMA. When the ASC conducted extensive surveys throughout the Upper Clark Fork River Basin in 2009 to obtain baseline information, the Spotted Dog property was privately owned and the landowner did not allow access for bird surveys. FWP was therefore lacking detailed information on bird community composition, abundance, and habitat associations on this important acquisition. A small survey effort was also undertaken at three other sites in the Upper Clark Fork River Basin: Stuart Mill Bay FAS, Blue-eyed Nellie WMA, and the Milltown Dam recovery area.

The Spotted Dog property was purchased in 2010 by FWP. Over a century of grazing practices has left the area with swaths of heavily browsed grassland. This area has a patchwork of small forests, shrub lands, and riparian areas, with several streams flowing through the site.

Sampling efforts on Spotted Dog WMA were focused especially on riparian corridors. An ASC point count technician surveyed these sites in order to get a starting knowledge of species composition and distribution across these FWP sites. This year's survey is the first step in establishing that baseline.

This information will be valuable in providing information to the different FWP managers of these diverse sites. These point count surveys can provide missing information about the bird and plant species composition across the surveyed sites. Filling in this missing information will allow for FWP to make better informed decisions with respect to land management on these sites. By gaining baseline knowledge of what bird species are present, knowledge of habitat health can be found out.

## **OBJECTIVES**

1. Design and conduct songbird surveys to obtain better baseline data on songbird diversity and relative abundance by habitat. Areas to be covered in 2013 surveys include Spotted Dog WMA, Stuart Mill Bay FAS, Blue-eyed Nellie WMA, and the Milltown Dam recovery area.
2. The sampling design will ensure points are spatially balanced and provide adequate representation in all major habitat types. Point counts will be conducted at previously established vegetation monitoring stations at Spotted Dog WMA.

## **SURVEY METHODS**

### **STUDY AREAS AND SURVEY DESIGN**

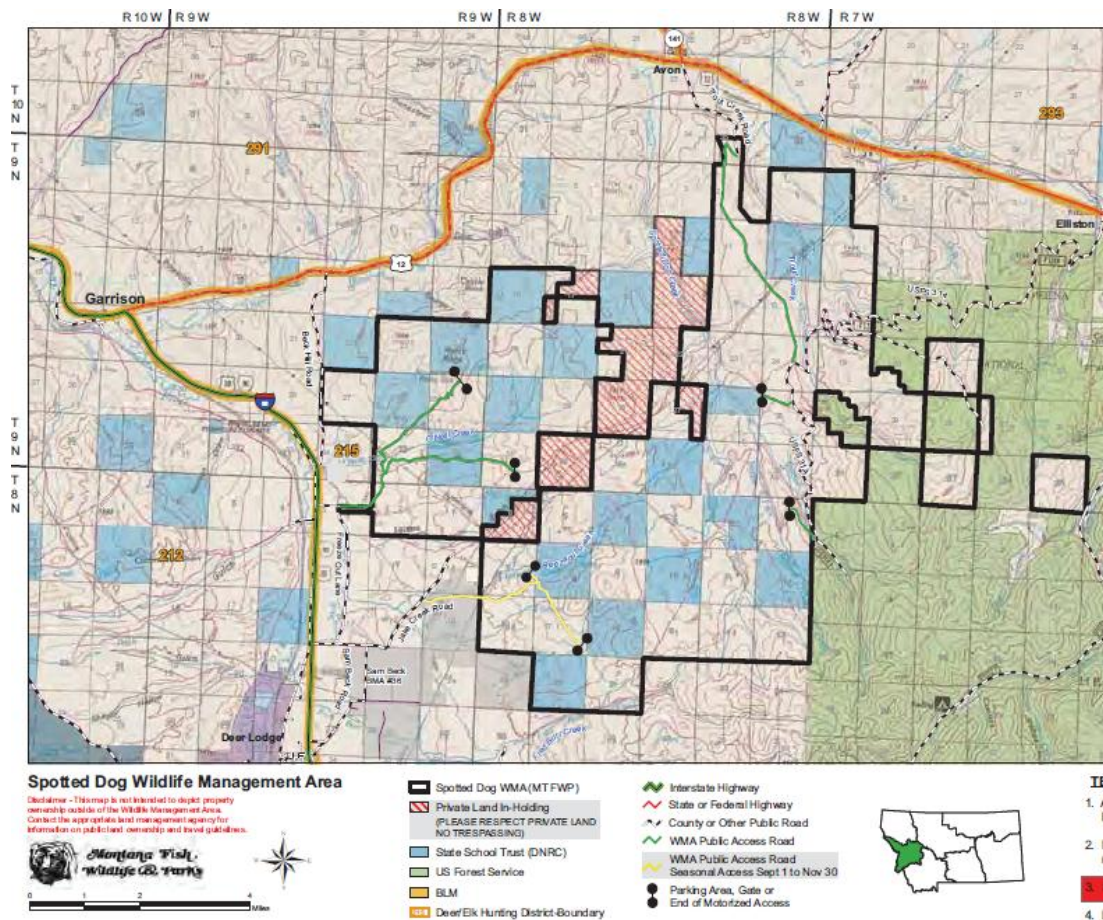
The primary study area was on the 37,887 acre Spotted Dog WMA and approximately 90% of the survey effort was focused here. A small number of counts were also conducted at three other study sites: Blue-eyed Nellie WMA near Anaconda, Stuart Mill Bay Fishing Access Site (FAS) at Georgetown Lake, and the Milltown Dam recovery area near Bonner.

In order to obtain baseline data on bird communities in all habitat types represented on Spotted Dog WMA we used a combination of spatially balanced sampling that distributed surveys in proportion to the available habitat and targeted sampling to adequately sample riparian habitats.

The survey design for spatially balanced sampling followed the GRTS design employed by a large, regional monitoring program implanted in parts of 13 western states, including Montana, – Integrated

Monitoring by Bird Conservation Region (IMBCR). The IMBCR program uses the Bird Conservation Region (BCR) as the sampling frame; within each BCR strata are selected based on fixed attributes, such as landownership (e.g. BLM district, USFWS refuge system, etc.). Within each stratum, sample units are surveyed by GRTS order (i.e. rank). By using the IMBCR design we have the option of including the Spotted Dog WMA as an “overlay strata” imposed over the existing stratification of BCR 10 and Montana’s statewide bird monitoring program. This would allow us to leverage bird detections from hundreds of points in the program in order to generate species detections functions used to adjust raw abundance estimates. This is ideal because one of the challenges in small studies is obtaining a sufficient number of detections; by participating in a larger program, we would be able to calculate density for most species detected on counts.

The sampling design was completed in ArcGIS v 10. The perimeter of Spotted Dog WMA, with minor modifications, was used as the sampling frame for selecting both spatially balanced and targeted riparian samples. Both FWP parcels and those managed by the Department of Natural Resources (DNRC) were included in the sampling frame; four parcels owned by US Forest Service were also included, one isolated FWP section was excluded, and all private lands were excluded (Figure 1).



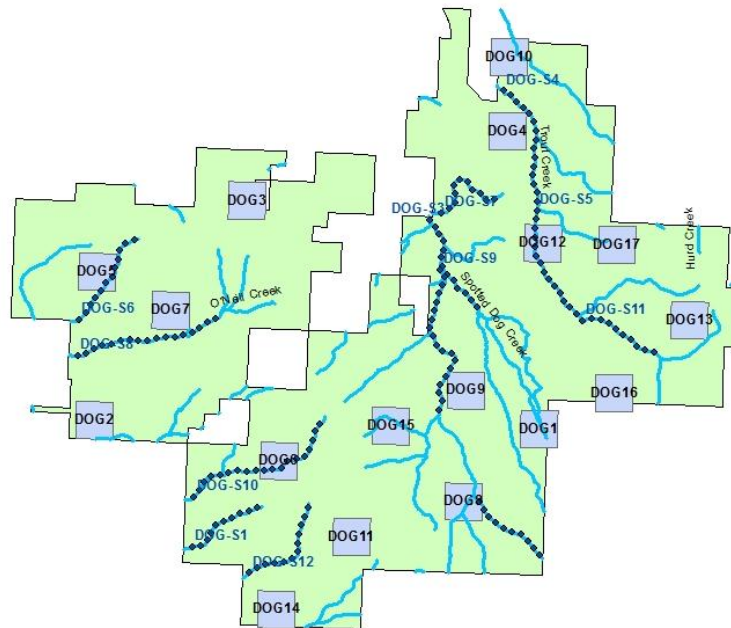
**Figure 1. Perimeter of Spotted Dog WMA is shown in bold. Parcel color denotes ownership: white – FWP, blue – State School Trust Lands (DNRC), green – US Forest Service, red-white hatched – private lands outside the WMA boundary.**

Using this perimeter, I clipped the layer of grid centers generated for BCR 10 for the IMBCR program. I then used a fishnet procedure to create a 1 km grid with 16 points, spaced 250m apart, around each



center point. Points that fell outside the sampling frame (i.e. perimeter) were excluded, so some grids had fewer than 16 points, and grids with fewer than 8 points were excluded. Grids were assigned a random number, or rank. The GRTS design uses a sophisticated spatial balancing algorithm to avoid clumping when assigning ranks. Due to time constraints and the relatively small size of the WMA we aimed for spatial balance by selecting the top 25 non-adjacent ranks. Thus if rank 10 was adjacent to rank 3, rank 10 was dropped from the sample and replaced with rank 11 or the next non-adjacent rank. We selected 15 ranks, or transects, as primary samples and 10 as backups (Figure 2). Three transects that fell on DNRC property were dropped and replaced with the highest ranked adjacent transect that fell on FWP land. This was done to ensure that a majority of points surveyed fell on FWP property.

The targeted riparian transects were selected by clipping a level 4 stream layer by the sampling frame and placing points 250m apart along the length of each stream segment. Each stream segment was then assigned a random rank and we selected the top 15 ranks – 10 as primary samples and five as backups (Figure 2). We also established bird point count stations at five locations on the Spotted Dog WMA that were identified by FWP biologists: one aspen enclosure and four previously established long-term vegetation monitoring stations.



**Figure 2. Distribution of spatially balanced point count grids and riparian transects on Spotted Dog study area.**

The survey design at the three other study areas was not randomized; we simply used the property boundary or project area to define the sampling area, used ArcGIS to space points 250m apart, and placed as many points as could be accommodated. At the Stuart Mill Bay FAS four points were placed in the recently logged habitat and nine points were placed in the unlogged habitat. We created two transects at the Milltown Dam restoration area – one site on the south/west side of the river in the recently restored floodplain and a second site on the north/east side of the river in remnant riparian habitat that existed prior to restoration work.

## VEGETATION SURVEYS



Bird variety is habitat dependent and point count technicians have to collect various vegetation data to get an idea of bird use in an area. With both sets of data we can figure out bird and habitat relations in a specific region. We had a technician collect primary habitat and species composition, as well as other data on the Spotted Dog WMA, Blue-eyed Nellie WMA, Milltown Dam recovery area, and Stuart Mill Bay FAS.

Many types of data were collected at each point, in relation to the habitat layers. These vegetation surveys were conducted within a 50m radius of each point. ReGAP assessment was used where possible on the Spotted Dog WMA, and consisted of figuring out what vegetation types were actually on a point when referenced with a ReGAP map. A primary habitat, chosen from the IMBCR (Hanni et al. 2013) habitat list, was assigned to each survey point based on primary vegetation or land type. Riparian points were also classified as wide ( $\geq 40$  m) or narrow. Canopy and shrub cover percentages were estimated for each point by the technician, as were canopy and shrub heights (m). There was a possibility of collecting data for up to five species of trees and shrubs for both the canopy and shrub layers, respectively. An IMBCR species list was used for species selection. All trees and shrubs were identified if possible, and notes were taken on unlisted or unknown species.

For all vegetation layers, percentages were assigned to each species according to its abundance at each point. Every percentage for each layer had to add to 100 percent. Aside from canopy and shrub layer composition, a technician collected ground cover percentages as well. Ground cover percentages covered snow, water, dead and down, herbaceous, bare litter, dead grass, and live grass. It also included dead grass height, and live grass and herbaceous height (cm). The purpose of these vegetation surveys was to get an idea of what the habitat was actually was at each point, since ReGAP data is not always reliable.

## BIRD SURVEYS

One technician, Tyler Clarke, was hired to conduct bird point count surveys on the Spotted Dog WMA, Blue-eyed Nellie WMA, Stuart Mill Bay FAS, and the Milltown Dam recovery area. Birds were counted using the IMBCR land bird survey protocol, which consisted of six minute points, consisting of one minute intervals (Hanni et al. 2013). Birds were counted based on song, call, visual identification, flyover identification, or other identifying characteristics. Birds were recorded within any distance of each point, and distance to each bird was recorded in meters. For every bird counted, the minute it was detected in was recorded as was how it was detected and the distance it was detected at. A four letter species code was recorded for each bird species detected.

## ANALYSIS

The raw number of individuals detected is presented for each bird species at each study site (Appendix I and III – VI). Relative bird abundance was calculated for detections at Spotted Dog WMA only, since a majority of the survey effort (89%) was restricted to this study area. As in the 2009 basin-wide report, relative abundance was calculated as the mean number of individuals using all detections within 100m of the point and we present relative abundance in each of four major habitat types (Appendix II).





## RESULTS

### SURVEY EFFORT

We surveyed 308 points on 30 transects that were distributed across four FWP properties: Spotted Dog WMA (26 transects), Blue-eyed Nellie WMA (1), Milltown Dam (2), and Stuart Mill Bay FAS (1) (Table 1). Almost all points were owned by Montana Fish, Wildlife & Parks or the Department of Natural Resources. Four points at the Milltown Dam site were privately owned and access permission was obtained prior to surveys. Ten transects on the Spotted Dog WMA were targeted to fall within riparian areas, 15 transects covered a range of habitats including conifer forest and grazed grasslands and shrub lands, and one “transect” consisted of points at four permanent vegetation monitoring stations and one aspen enclosure. The Stuart Mill Bay transect included both recently logged (winter 2012/2013) forest and unlogged forest for comparison. The two transects at Milltown Dam were located on the Clark Fork River just upstream from the recently restored confluence with the Blackfoot River. The riparian habitat at this site encompassed a range of conditions, including remnant riparian patches, but a majority of points were located in newly restored areas with sparse shrub cover.

**Table 1. Number of transects and points surveyed at each FWP property.**

Site	Transects	Points
<b>Spotted Dog WMA</b>	26	273
<b>Blue-eyed Nellie WMA</b>	1	7
<b>Milltown Dam</b>	2	19
<b>Stuart Mill Bay FAS</b>	1	9
<b>Total</b>	<b>30</b>	<b>308</b>

### HABITAT CHARACTERIZATION

The field technician assigned each point a primary habitat and points fell into one of nine habitat types (Table 2). However, a majority of points fell within grassland and riparian habitats and for most primary habitats we did not have a sufficient number of points to calculate meaningful estimates of relative abundance. For this reason we lumped points into one of four habitat types for analysis: grassland, shrub-land, conifer forest, or riparian (Table 2).

**Table 2. Each point was assigned one of nine primary habitats in the field; points were lumped into four habitat types for analysis.**

Primary Habitat	points	Habitat type	points
<b>Grassland</b>	109	Grassland	110
<b>Montane meadow</b>	1		
<b>Shrubland (non-sage)</b>	22	Shrub-land	29
<b>Sagebrush</b>	6		
<b>Pinyon-juniper</b>	1		
<b>Mixed conifer forest</b>	58	Conifer forest	64
<b>Lodgepole forest</b>	6		
<b>Riparian</b>	103	Riparian	105
<b>Aspen</b>	2		
<b>Total</b>	<b>308</b>	<b>Total</b>	<b>308</b>

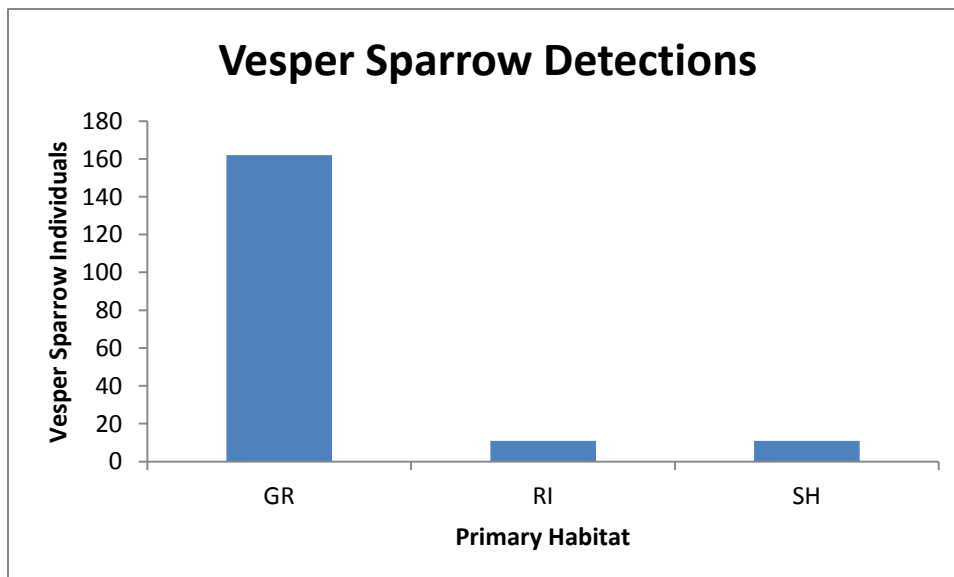
Riparian points were constrained to fall within the stream channel and the technician classified 86% of these points as supporting riparian habitat. Had we not created this habitat strata, only 6% of the grid transect points surveyed were classified as riparian habitat. Most of the grassland and shrub-land habitats on the Spotted Dog WMA showed obvious signs of long term grazing. The riparian habitats also showed signs of grazing.

#### BIRD SURVEYS

Bird surveys were conducted between May 30, 2013 and July 12, 2013 between 0530 and 1100. Severe weather such as high winds, heavy rain, or snow stopped a survey attempt. We had a total of 2803 detections representing 86 species and 2933 individuals on counts. Four of these species were detected only while walking between point count stations: Northern Harrier, Northern Goshawk, Prairie Falcon, and Spruce Grouse. Species diversity was highest at Spotted Dog (72 species) and lowest at Blue-eyed Nellie (24), but diversity also tracked sampling effort.

Since the survey effort was focused on Spotted Dog WMA (89% of points) we calculated relative bird abundance only at this site. Relative abundance in each of four habitat types was calculated for 61 species detected within 100m of the point (Appendix II). About half of these species had ten or more detections and for nearly all species (28 of 29) relative abundance differed significantly ( $p \leq 0.05$ ) among habitat types. While this is unsurprising, it underscores the importance of understanding bird-habitat relationships as most species are habitat specialists (Figure 1).

Brewer's sparrows were in such low numbers ( $n = 10$ ) that a comparison of sage brush versus shrubland habitats was not possible. However, Brewer's Sparrows were not found in shrubland habitat – all detections came from habitats that contained a high percentage of sagebrush.



**Figure 1. Vesper Sparrow detections varied significantly among habitat types, revealing a strong association with grassland habitat. GR – grassland, RI – riparian, and SH – shrubland.**

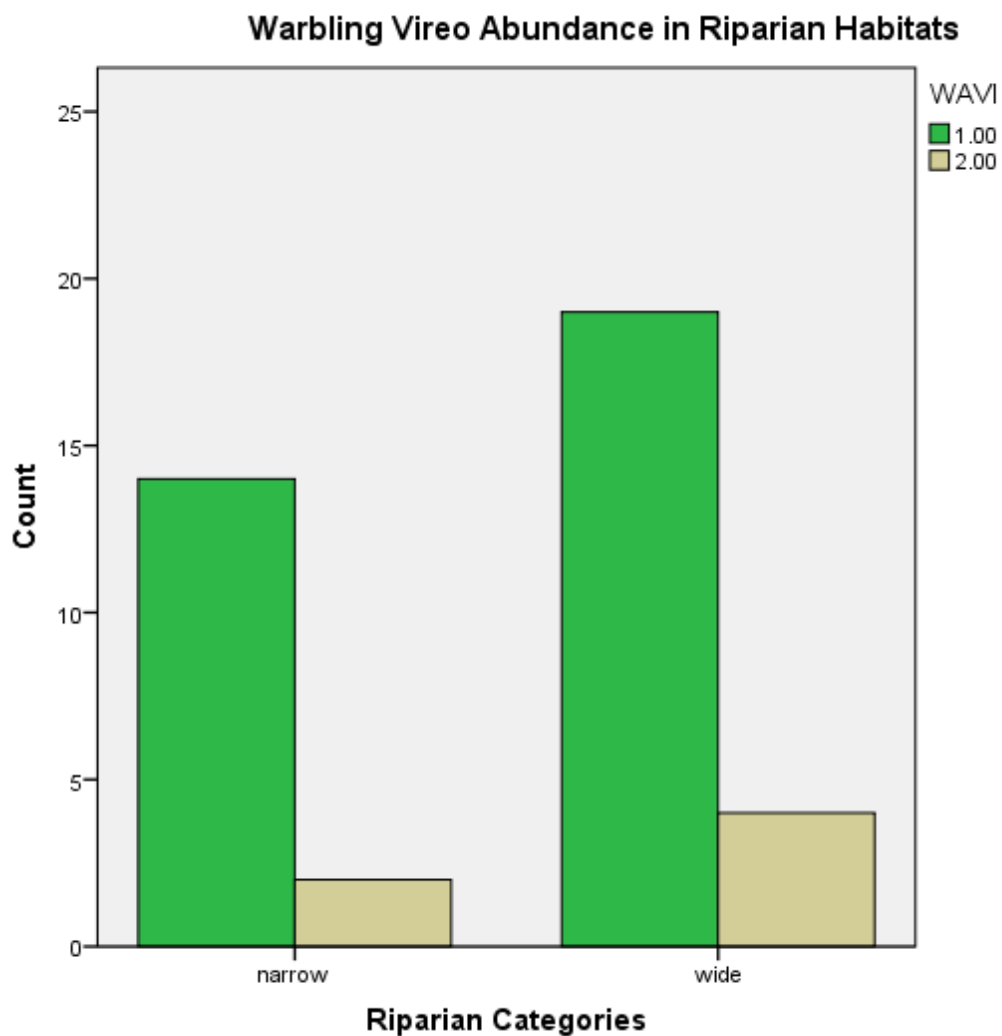
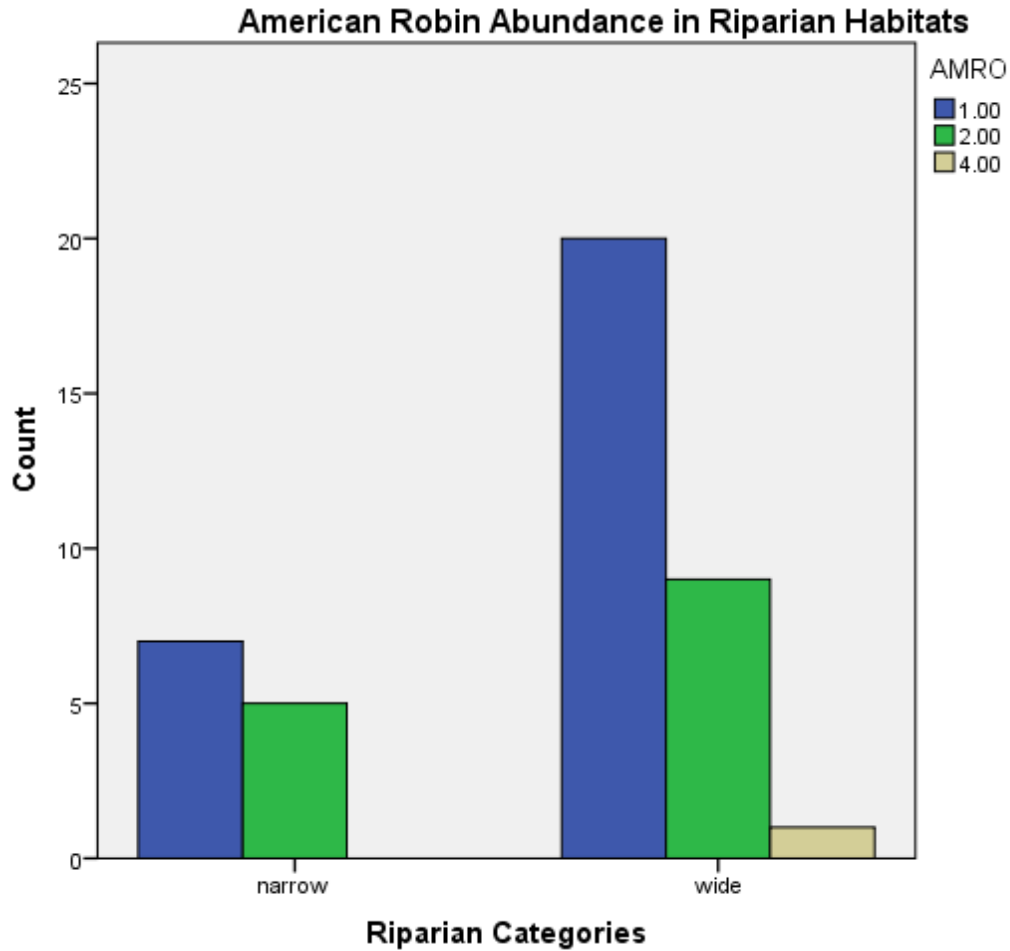


Figure 2. Greater numbers of Warbling Vireos were detected in wide (> 40m) riparian patches.



The warbling vireo is a habitat specialist and is found primarily within aspen stands and riparian areas. The warbling vireo was detected more frequently in wide riparian corridors ( $\geq 40$  m) than in narrow stringers (Figure 2). Warbling vireos and many other species are reliant on healthy riparian corridors can be indicators of riparian habitat health.



**Figure 3. American Robins were detected more frequently in wide riparian patches.**

Even habitat generalists, such as the American Robin, were found in greater numbers in wider riparian habitats (Figure 3). This supports previous studies which show that both bird abundance and diversity are positively correlated with width of the riparian patch.



## **DISCUSSION AND MANAGEMENT IMPLICATIONS**

The spotted Dog WMA purchase represents a great deal of land and financial investment by Montana FWP. In order to restore and preserve lands in the proper proportions, FWP needs as much species and habitat health information as possible.

Across all survey sites, six species on Montana's SOC list were detected: Common Loon (Stuart Mill Bay FAS only), Great Blue Heron, Northern Goshawk, Long-billed Curlew (7), Clark's Nutcracker (113), and Brewer's Sparrow (14). These species could be targeted for special management actions. Much of the shrubland habitat on Spotted Dog WMA lacked dense sagebrush cover and this may explain why several sage dependent bird species, most notably the Brewer's sparrow, are rarely encountered.

Many of the grasslands at Spotted Dog WMA were moderately to heavily grazed. Bird species composition in these grasslands was dominated by Vesper Sparrows and Western Meadowlark. These grasslands, if restored, could potentially host a greater diversity of bird species.

The riparian corridors surveyed on Spotted Dog WMA varied in size and composition. Riparian corridors seemed to be disrupted by heavily grazed grasslands. These riparian corridors accounted for a lot of the bird species richness found throughout the surveys, and are good places to start when asking questions about bird distribution across the landscape.

Restoration and recovery of the native habitat types, if allowed to continue, might increase bird species diversity within the Spotted Dog WMA. As the collected data shows, some habitat types and habitats' health may play a direct role in species diversity across the Spotted Dog WMA.

**Appendix I.** Total number of individuals detected on counts at each of four study areas: Spotted Dog WMA, Blue-eyed Nellie WMA, Stuart Mill Bay FAS, and Milltown Dam Recovery Area.

<b>Species</b>	<b>Spotted Dog</b>	<b>Blue-eyed Nellie</b>	<b>Stuart Mill Bay</b>	<b>Milltown Dam</b>	<b>Total</b>	<b>SOC priority</b>
Common Loon	-	-	1	-	1	S3B
Red-necked Grebe	-	-	8	-	8	
Great Blue Heron	1	-	-	<sup>a</sup>	1	S3
Canada Goose	22 <sup>b</sup>	-	-	<sup>a</sup>	22	
Mallard	-	-	-	1	1	
Osprey	-	-	-	2	2	
Northern Harrier	<sup>a</sup>	-	-	-	<sup>a</sup>	
Northern Goshawk	<sup>a</sup>	-	-	-	<sup>a</sup>	S3
Swainson's Hawk	2	-	-	-	2	
Red-tailed Hawk	7	-	<sup>a</sup>	-	7	
American Kestrel	7	1	-	1	9	
Prairie Falcon	<sup>a</sup>	-	-	-	<sup>a</sup>	
Ruffed Grouse	1	-	-	-	1	
Spruce Grouse		-	-	-	<sup>a</sup>	
Sandhill Crane	6	-	-	-	6	
Killdeer	-	-	<sup>a</sup>	4	4	
Spotted Sandpiper	1	-	-	10	11	
Long-billed Curlew	7	-	-	-	7	S3B
Wilson's Snipe	19	-	-	-	19	
Common Nighthawk	17	-	-	-	17	
Calliope Hummingbird	-	-	-	2	2	
Belted Kingfisher	1	-	-	1	2	
Red-naped Sapsucker	14	-	-	3	17	
Downy Woodpecker	4	-	-	-	4	
Hairy Woodpecker	12	-	-	-	12	
Northern Flicker	66	1	1	11	79	
Olive-sided Flycatcher	11	-	-	-	11	
Western Wood-Pewee	54	1	4	10	69	
Willow Flycatcher	34	-	3	8	45	
Least Flycatcher	1	-	-	-	1	
Hammond's Flycatcher	19	-	-	-	19	
Dusky Flycatcher	20	-	-	-	20	
Eastern Kingbird	1	-	-	<sup>a</sup>	1	
Warbling Vireo	89	9	6	5	109	
Gray Jay	-	-	3	-	3	
Clark's Nutcracker	113	3	6		122	S3
Black-billed Magpie	11	-	-	16	27	
Common Raven	38	-	9	-	47	
Horned Lark	64	1	-	-	65	
Tree Swallow	6	1	2	13	22	



Species	Spotted Dog	Blue-eyed Nellie	Stuart Mill Bay	Milltown Dam	Total	SOC priority
Northern Rough-winged Swallow	1	-	-	-	1	
Bank Swallow	6	-	-	7	13	
Cliff Swallow	-	-	-	10	10	
Black-capped Chickadee	1	2	1	8	12	
Mountain Chickadee	102	3	5	-	110	
Red-breasted Nuthatch	26	-	2	1	29	
Rock Wren	24	3	-	-	27	
House Wren	29	-	-	13	42	
Golden-crowned Kinglet	1	-	1	-	2	
Ruby-crowned Kinglet	110	2	3	-	115	
Mountain Bluebird	18	-	3	-	21	
Townsend's Solitaire	5	-	1	-	6	
Swainson's Thrush	3	1	-	-	4	
Hermit Thrush	11	-	-	-	11	
American Robin	174	6	13	8	201	
Gray Catbird	5	-	-	-	5	
European Starling	3	-	-	6	9	
Cedar Waxwing	6	-	-	3	9	
Orange-crowned Warbler	3	-	-	-	3	
Yellow Warbler	63	1	2	21	87	
Yellow-rumped Warbler	53	-	10	1	64	
American Redstart	2	1	1	-	4	
Northern Waterthrush	-	1	-	-	1	
MacGillivray's Warbler	18				18	
Common Yellowthroat	-	-	-	14	14	
Western Tanager	51	1	3	2	57	
Spotted Towhee	3	-	-	1	4	
Chipping Sparrow	54	3	3	-	60	
Brewer's Sparrow	10	4	-	-	14	S3B
Vesper Sparrow	397	2	-	-	399	
Savannah Sparrow	48	-	1	-	49	
Song Sparrow	-	-	3	10	13	
Lincoln's Sparrow	8	-	-	-	8	
White-crowned Sparrow	24	4	3	-	31	
Dark-eyed Junco	77	-	7	-	84	
Black-headed Grosbeak	-	-	-	4	4	
Lazuli Bunting	10	1	-	-	11	
Red-winged Blackbird	-	-	3	32	35	
Western Meadowlark	285	-	-	-	285	
Brewer's Blackbird	12	-	-	-	12	
Brown-headed Cowbird	85	-	5	13	103	
Bullock's Oriole	3	-	-	5	8	

<b>Species</b>	<b>Spotted Dog</b>	<b>Blue-eyed Nellie</b>	<b>Stuart Mill Bay</b>	<b>Milltown Dam</b>	<b>Total</b>	<b>SOC priority</b>
<b>House Finch</b>	-	-	-	2	<b>2</b>	
<b>Red Crossbill</b>	19 <sup>c</sup>	2	10	-	<b>31</b>	
<b>Pine Siskin</b>	92	2	4	4	<b>102</b>	
<b>American Goldfinch</b>	6	-	-	2	<b>8</b>	
<b>Total species</b>	<b>73</b>	<b>24</b>	<b>33</b>	<b>38</b>	<b>86</b>	

<sup>a</sup> This species detected only while walking between points; <sup>b</sup> 22 individuals detected come from just 4 detections; <sup>c</sup> 19 individuals detected come from just 5 detections.

**Appendix II.** Mean relative abundance  $\pm$  the standard deviation (SD) for all species detected at Spotted Dog WMA in each of 4 habitat types.

Species	Conifer Forest (n = 54)			Shrub-Land (n = 24)			Grassland (n = 91)			Riparian (n = 89)			All habitats (n = 258)		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
Red-tailed Hawk	-		0	-		0	-		0	0.01	$\pm$ 0.11	1	0.00	$\pm$ 0.06	1
American Kestrel	0.02	$\pm$ 0.14	1	-		0	-		0	0.02	$\pm$ 0.15	2	0.01	$\pm$ 0.11	3
Ruffed Grouse	-		0	-		0	-		0	0.01	$\pm$ 0.11	1	0.00	$\pm$ 0.06	1
Spotted Sandpiper	-		0	-		0	-		0	0.01	$\pm$ 0.11	1	0.00	$\pm$ 0.06	1
Wilson's Snipe	0.02	$\pm$ 0.14	1	-		0	-		0	-		0	0.00	$\pm$ 0.06	1
Common Nighthawk	-		0	-		0	0.04	$\pm$ 0.25	4	0.02	$\pm$ 0.15	2	0.02	$\pm$ 0.17	6
Belted Kingfisher	-		0	-		0	-		0	0.01	$\pm$ 0.11	1	0.00	$\pm$ 0.06	1
Red-naped Sapsucker	0.04	$\pm$ 0.19	2	-		0	-		0	0.11	$\pm$ 0.32	10	0.05	$\pm$ 0.21	12
Downy Woodpecker	0.07	$\pm$ 0.33	4	-		0	-		0	-		0	0.02	$\pm$ 0.15	4
Hairy Woodpecker	0.19	$\pm$ 0.48	10	-		0	0.01	$\pm$ 0.10	1	-		0	0.04	$\pm$ 0.24	11
Northern Flicker	0.17	$\pm$ 0.42	9	0.04	$\pm$ 0.20	1	-		0	0.11	$\pm$ 0.34	10	0.08	$\pm$ 0.28	20
Olive-sided Flycatcher	0.04	$\pm$ 0.19	2	-		0	-		0	0.04	$\pm$ 0.21	4	0.02	$\pm$ 0.15	6
Western Wood-Pewee	0.19	$\pm$ 0.62	10	-		0	-		0	0.19	$\pm$ 0.45	17	0.10	$\pm$ 0.40	27
Willow Flycatcher	-		0	-		0	-		0	0.27	$\pm$ 0.64	24	0.09	$\pm$ 0.39	24
Least Flycatcher	-		0	-		0	-		0	0.01	$\pm$ 0.11	1	0.00	$\pm$ 0.06	1
Hammond's Flycatcher	0.07	$\pm$ 0.26	4	-		0	-		0	0.13	$\pm$ 0.43	12	0.06	$\pm$ 0.29	16
Dusky Flycatcher	0.15	$\pm$ 0.49	8	-		0	-		0	0.11	$\pm$ 0.32	10	0.07	$\pm$ 0.30	18
Eastern Kingbird	-		0	-		0	-		0	0.01	$\pm$ 0.11	1	0.00	$\pm$ 0.06	1
Warbling Vireo	0.22	$\pm$ 0.46	12	-		0	0.02	$\pm$ 0.15	2	0.55	$\pm$ 0.66	49	0.24	$\pm$ 0.51	63
Clark's Nutcracker	0.22	$\pm$ 0.60	12	0.04	$\pm$ 0.20	1	-		0	0.09	$\pm$ 0.36	8	0.08	$\pm$ 0.36	21
Black-billed Magpie	-		0	-		0	-		0	0.02	$\pm$ 0.15	2	0.01	$\pm$ 0.09	2
Common Raven	0.02	$\pm$ 0.14	1	-		0	-		0	-		0	0.00	$\pm$ 0.06	1
Horned Lark	-		0	0.38	$\pm$ 0.58	9	0.52	$\pm$ 0.99	47	0.06	$\pm$ 0.28	5	0.24	$\pm$ 0.67	61
Tree Swallow	-		0	-		0	0.03	$\pm$ 0.23	3	0.01	$\pm$ 0.11	1	0.02	$\pm$ 0.15	4
Northern Rough-winged Swallow	-		0	0.04	$\pm$ 0.20	1	-		0	-		0	0.00	$\pm$ 0.06	1
Bank Swallow	-		0	-		0	-		0	0.07	$\pm$ 0.39	6	0.02	$\pm$ 0.23	6
Black-capped Chickadee	-		0	-		0	-		0	0.01	$\pm$ 0.11	1	0.00	$\pm$ 0.06	1
Mountain Chickadee	0.70	$\pm$ 1.13	38	-		0	-		0	0.33	$\pm$ 0.58	29	0.26	$\pm$ 0.67	67

	Conifer Forest (n = 54)			Shrub-Land (n = 24)			Grassland (n = 91)			Riparian (n = 89)			All habitats (n = 258)		
Species	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
Red-breasted Nuthatch	0.15	± 0.36	8	-		0	-		0	0.02	± 0.15	2	0.04	± 0.19	10
Rock Wren	0.00	± 0.00	0	-		0	0.02	± 0.15	2	0.02	± 0.15	2	0.02	± 0.12	4
House Wren	-		0	-		0	-		0	0.29	± 0.63	26	0.10	± 0.39	26
Golden-crowned Kinglet	-		0	-		0	-		0	0.01	± 0.11	1	0.00	± 0.06	1
Ruby-crowned Kinglet	0.56	± 0.74	30	-		0	0.02	± 0.15	2	0.35	± 0.59	31	0.24	± 0.54	63
Mountain Bluebird	0.07	± 0.26	4	-		0	0.02	± 0.15	2	0.01	± 0.11	1	0.03	± 0.16	7
Townsend's Solitaire	0.02	± 0.14	1	-		0	-		0	0.02	± 0.15	2	0.01	± 0.11	3
Swainson's Thrush	0.02	± 0.14	1	-		0	-		0	0.01	± 0.11	1	0.01	± 0.09	2
Hermit Thrush	0.06	± 0.30	3	-		0	-		0	0.01	± 0.11	1	0.02	± 0.15	4
American Robin	0.39	± 0.63	21	0.04	± 0.20	1	0.01	± 0.10	1	0.69	± 0.83	61	0.33	± 0.64	84
Gray Catbird	-		0	-		0	-		0	0.06	± 0.28	5	0.02	± 0.16	5
European Starling	-		0	0.13	± 0.61	3	-		0	-		0	0.01	± 0.19	3
Cedar Waxwing	0.00	± 0.00	0	-		0	-		0	0.07	± 0.36	6	0.02	± 0.21	6
Orange-crowned Warbler	0.04	± 0.19	2	-		0	-		0	-		0	0.01	± 0.09	2
Yellow Warbler	-		0	-		0	0.01	± 0.10	1	0.53	± 0.76	47	0.19	± 0.51	48
Yellow-rumped Warbler	0.26	± 0.44	14	0.04	± 0.20	1	0.01	± 0.10	1	0.25	± 0.51	22	0.15	± 0.39	38
MacGillivray's Warbler	0.02	± 0.14	1	-		0	-		0	0.15	± 0.41	13	0.05	± 0.26	14
Western Tanager	0.41	± 0.57	22	-		0	-		0	0.11	± 0.32	10	0.12	± 0.35	32
Spotted Towhee	0.06	± 0.23	3	-		0	-		0	-		0	0.01	± 0.11	3
Chipping Sparrow	0.41	± 0.57	22	0.08	± 0.28	2	-		0	0.13	± 0.34	12	0.14	± 0.37	36
Brewer's Sparrow	-		0	-		0	0.01	± 0.10	1	0.02	± 0.21	2	0.01	± 0.14	3
Vesper Sparrow	0.48	± 0.82	26	0.88	± 1.36	21	1.37	± 1.24	125	0.18	± 0.47	16	0.73	± 1.09	188
Savannah Sparrow	-		0	-		0	0.42	± 0.90	38	0.06	± 0.44	5	0.17	± 0.62	43
Lincoln's Sparrow	0.04	± 0.27	2	-		0	-		0	0.03	± 0.18	3	0.02	± 0.16	5
White-crowned Sparrow	0.07	± 0.26	4	-		0	-		0	0.13	± 0.38	12	0.06	± 0.26	16
Dark-eyed Junco	0.70	± 0.94	38	-		0	0.03	± 0.23	3	0.26	± 0.55	23	0.25	± 0.61	64
Lazuli Bunting	0.00	± 0.00	0	-		0	-		0	0.11	± 0.35	10	0.04	± 0.21	10
Western Meadowlark	0.13	± 0.39	7	0.46	± 0.72	11	0.55	± 0.89	50	0.13	± 0.55	12	0.31	± 0.70	80
Brown-headed Cowbird	0.37	± 0.81	20	0.21	± 0.41	5	0.05	± 0.35	5	0.49	± 0.74	44	0.29	± 0.64	74
Bullock's Oriole			0	0.08	± 0.41	2	-		0	0.01	± 0.11	1	0.01	± 0.14	3
Red Crossbill	0.19	± 1.36	10	-		0	-		0	-		0	0.04	± 0.62	10
Pine Siskin	0.41	± 0.57	22	0.04	± 0.20	1	0.04	± 0.25	4	0.53	± 0.92	47	0.29	± 0.66	74
American Goldfinch			0	0.04	± 0.20	1	-		0	0.03	± 0.18	3	0.02	± 0.12	4

### Appendix III. Bird list and summary for Blue-eyed Nellie WMA.

In June of 2013 the Avian Science Center conducted bird surveys at Blue-eyed Nellie WMA. Birds were surveyed using point counts, in which an observer records a distance to every bird seen or heard within a six minute count period. Birds were also recorded while walking between points. The observer conducted seven counts and points were distributed among grassland, shrubland, and conifer forest habitat types.

A total of 56 individuals representing 24 species were detected, including two SOC species: Clark's Nutcracker and Brewer's Sparrow. The bird species encountered reflect the diversity of habitat types present on the WMA. Although none of the vegetation within 50 m of the point count stations was classified as wetland-riparian, the Yellow Warbler, American Redstart, and Northern Waterthrush detected suggest a stream is nearby. The Brewer's Sparrow suggests dense sagebrush habitat, as this species is a sagebrush obligate.

**Table 1. A total 56 of birds representing 24 species were detected at Blue-eyed Nellie WMA. Species in *italics* are designated as Species of Concern by the Montana Natural Heritage Program.**

Species	# birds	Habitat <sup>a</sup>	Species	# birds	Habitat <sup>a</sup>
American Kestrel	1	CF	American Robin	6	CF
Northern Flicker	1	CF	Yellow Warbler	1	W-R
Western Wood-Pewee	1	CF	American Redstart	1	W-R
Warbling Vireo	9	W-R	Northern Waterthrush	1	W-R
<i>Clark's Nutcracker</i>	3	CF	Western Tanager	1	CF
Horned Lark	1	G	Chipping Sparrow	3	CF
Tree Swallow	1	W-R	<i>Brewer's Sparrow</i>	4	SA
Black-capped Chickadee	2	W-R	Vesper Sparrow	2	G
Mountain Chickadee	3	CF	White-crowned Sparrow	4	CF
Rock Wren	3	CF	Lazuli Bunting	1	SH
Ruby-crowned Kinglet	2	CF	Red Crossbill	2	CF
Swainson's Thrush	1	CF	Pine Siskin	2	CF
<b>Total species</b>			<b>24</b>		

<sup>a</sup> Habitat codes: W-R – Wetland-Riparian; CF – Conifer Forest; SA – Sagebrush; SH – Shrubland; G – Grassland

**Appendix IV.** Bird list and summary for Spotted Dog WMA.

In June of 2013 the Avian Science Center conducted bird surveys at Spotted Dog WMA. Birds were surveyed using point counts, in which an observer records a distance to every bird seen or heard within a six minute count period. Birds were also recorded while walking between points. The observer surveyed 26 transects and a total of 273 points distributed among four major habitat types: grassland, shrubland, conifer forest, and wetland-riparian.

A total of 2455 individuals representing 73 species were detected, including four SOC species: Great Blue Heron, Northern Goshawk, Clark's Nutcracker, and Brewer's Sparrow. The bird species encountered reflect the diversity of habitat types present on the WMA. Grassland habitats had relatively low species diversity and were dominated by Vesper Sparrow and Western Meadowlark. However, the presence of Long-billed Curlew suggests some patches of high quality grassland habitat. The list of wetland-riparian species detected suggests a diversity of wetland habitat types: Wilson's Snipe, Sandhill Crane, and Lincoln's Sparrow suggest marsh or wet meadow habitat; Hammond's Flycatcher and MacGillivray's Warbler indicate forested riparian zones, while Willow & Least Flycatcher, Gray Catbird, and Warbling Vireo suggest dense willow-riparian habitats.



**Table 1. A total Y of birds representing X species were detected at Stuart Mill Bay FAS. Species in *italics* are designated as Species of Concern by the Montana Natural Heritage Program.**

Species	# birds	Habitat <sup>a</sup>	Species	# birds	Habitat <sup>a</sup>
<i>Great Blue Heron</i>	1	W-R	Black-capped Chickadee	1	W-R
Canada Goose	22 <sup>c</sup>	W-R	Mountain Chickadee	102	CF
Northern Harrier	<sup>b</sup>	W-R	Red-breasted Nuthatch	26	CF
<i>Northern Goshawk</i>	<sup>b</sup>	CF	Rock Wren	24	CF
Swainson's Hawk	2	G	House Wren	29	W-R
Red-tailed Hawk	7	Any	Golden-crowned Kinglet	1	CF
American Kestrel	7	CF	Ruby-crowned Kinglet	110	CF
Prairie Falcon	a	G	Mountain Bluebird	18	CF
Ruffed Grouse	1	W-R	Townsend's Solitaire	5	CF
Spruce Grouse	a	CF	Swainson's Thrush	3	CF
Sandhill Crane	6	W-R	Hermit Thrush	11	CF
Spotted Sandpiper	1	W-R	American Robin	174	CF
<i>Long-billed Curlew</i>	7	G	Gray Catbird	5	W-R
Wilson's Snipe	19	W-R	European Starling	3	H
Common Nighthawk	17	CF	Cedar Waxwing	6	W-R
Belted Kingfisher	1	W-R	Orange-crowned Warbler	3	CF
Red-naped Sapsucker	14	W-R	Yellow Warbler	63	W-R
Downy Woodpecker	4	W-R	Yellow-rumped Warbler	53	CF
Hairy Woodpecker	12	CF	American Redstart	2	W-R
Northern Flicker	64	CF	MacGillivray's Warbler	18	CF
Red-shafted Flicker	2	CF	Western Tanager	51	CF
Olive-sided Flycatcher	11	CF	Spotted Towhee	3	W-R
Western Wood-Pewee	54	CF	Chipping Sparrow	54	CF
Willow Flycatcher	34	W-R	<i>Brewer's Sparrow</i>	10	SA
Least Flycatcher	1	W-R	Vesper Sparrow	397	G
Hammond's Flycatcher	19	CF	Savannah Sparrow	48	G
Dusky Flycatcher	20	SH	Lincoln's Sparrow	8	W-R
Eastern Kingbird	1	G	White-crowned Sparrow	24	CF
Warbling Vireo	89	W-R	Dark-eyed Junco	77	CF
<i>Clark's Nutcracker</i>	113	CF	Lazuli Bunting	10	SH
Black-billed Magpie	11	G	Western Meadowlark	285	G
Common Raven	38	CF	Brewer's Blackbird	12	W-R
Horned Lark	64	G	Brown-headed Cowbird	85	Any
Tree Swallow	6	W-R	Bullock's Oriole	3	W-R
N. Rough-winged Swallow	1	W-R	Red Crossbill	19 <sup>d</sup>	CF
Bank Swallow	6	W-R	Pine Siskin	92	CF
Black-capped Chickadee	1	W-R	American Goldfinch	6	W-R
Mountain Chickadee	102	CF	<b>Total species</b>	<b>73</b>	

<sup>a</sup> Habitat codes: Any – generalist, found in all habitats; H – Human dominated areas; W-R – Wetland-Riparian; CF – Conifer Forest; SA – Sagebrush; SH – Shrubland; G – Grassland; <sup>b</sup> This species detected only while walking between points; <sup>c</sup> 22 individuals come from just 4 detections; <sup>d</sup> 19 individuals come from just 5 detections

## Appendix V. Bird list and summary for Stuart Mill Bay FAS.

In June of 2013 the Avian Science Center conducted bird surveys at Stuart Mill Bay FAS. Birds were surveyed using point counts, in which an observer records a distance to every bird seen or heard within a six minute count period. Birds were also recorded while walking between points. The observer conducted nine counts and points were distributed between the recently logged area and uncut forest.

A total of 127 individuals representing 33 species were detected, including two SOC species: Common Loon and Clark's Nutcracker. The bird species encountered reflect the diversity of habitat types present at the fishing access site. Although counts were conducted in the forested habitat above Georgetown Lake, a number of open water and wetland dependent species were detected at a distance (e.g. Common Loon, Red-necked Grebe, Killdeer, and Willow Flycatcher). A majority of the remaining species are conifer forest species (e.g. Gray Jay, Clark's Nutcracker, Yellow-rumped Warbler, and Western Tanager). In an attempt to retain habitat for wildlife, including cavity nesting birds, numerous snags and several small patches of live trees were retained in the logged area. A number of species that utilize open forest types and snags were detected, including Northern Flicker, Western Wood-Pewee, Tree Swallow, Mountain Bluebird, and Townsend's Solitaire.

**Table 1. A total of 127 birds representing 33 species were detected at Stuart Mill Bay FAS. Species in *italics* are designated as Species of Concern by the Montana Natural Heritage Program.**

Species	# birds	Habitat <sup>a</sup>	Species	# birds	Habitat <sup>a</sup>
<i>Common Loon</i>	1	OW	Mountain Bluebird	3	CF
Red-necked Grebe	8	OW	Townsend's Solitaire	1	CF
Red-tailed Hawk	<sup>b</sup>	Any	American Robin	13	CF
Killdeer	<sup>b</sup>	W-R	Yellow Warbler	2	W-R
Northern Flicker	1	CF	Yellow-rumped Warbler	10	CF
Western Wood-Pewee	4	CF	American Redstart	1	W-R
Willow Flycatcher	3	W-R	Western Tanager	3	CF
Warbling Vireo	6	W-R	Chipping Sparrow	3	CF
Gray Jay	3	CF	Savannah Sparrow	1	G
<i>Clark's Nutcracker</i>	6	CF	Song Sparrow	3	W-R
Common Raven	9	CF	White-crowned Sparrow	3	CF
Tree Swallow	2	W-R	Dark-eyed Junco	7	CF
Black-capped Chickadee	1	W-R	Red-winged Blackbird	3	W-R
Mountain Chickadee	5	CF	Brown-headed Cowbird	5	CF
Red-breasted Nuthatch	2	CF	Red Crossbill	10	CF
Golden-crowned Kinglet	1	CF	Pine Siskin	4	CF
Ruby-crowned Kinglet	3	CF	<b>Total species</b>	<b>33</b>	

<sup>a</sup> Habitat codes: Any – generalist, found in all habitats; OW – Open Water; W-R – Wetland-Riparian; CF – Conifer Forest; G – Grassland

<sup>b</sup> This species detected only while walking between points

## Appendix VI. Bird list and summary for Milltown Dam Recovery Area.

In June of 2013 the Avian Science Center conducted bird surveys at the Milltown Dam Recovery Area. Birds were surveyed using point counts, in which an observer records a distance to every bird seen or heard within a six minute count period. Birds were also recorded while walking between points. Two transects were surveyed at the site, one on the south/west side of the river in the recently restored floodplain and a second transect on the north/east side of the river in remnant riparian habitat that existed prior to restoration work.

A total of 254 individuals representing 38 species were detected, including one SOC species: Great Blue Heron. A majority of the bird species recorded are wetland-riparian associated species. The presence of species such as Willow Flycatcher, Warbling Vireo, and Black-headed Grosbeak indicate that part of the site supports a well developed shrub layer. Species such as Bullock's Oriole and Red-naped Sapsucker reveal the presence of mature cottonwood trees. Cliff swallows and Belted Kingfisher validate the presence of cliffs.

**Table 1. A total 254 of birds representing 38 species were detected at the Milltown Dam Recovery Area. Species in *italics* are designated as Species of Concern by the Montana Natural Heritage Program.**

Species	# birds	Habitat <sup>a</sup>	Species	# birds	Habitat <sup>a</sup>
<i>Great Blue Heron</i>	<sup>b</sup>	W-R	Black-capped Chickadee	8	W-R
Canada Goose	<sup>b</sup>	W-R	Red-breasted Nuthatch	1	CF
Mallard	1	W-R	House Wren	13	W-R
Osprey	2	W-R	American Robin	8	CF
American Kestrel	1	CF	European Starling	6	H
Killdeer	4	W-R	Cedar Waxwing	3	W-R
Spotted Sandpiper	10	W-R	Yellow Warbler	21	W-R
Calliope Hummingbird	2	CF	Yellow-rumped Warbler	1	CF
Belted Kingfisher	1	W-R	Common Yellowthroat	14	W-R
Red-naped Sapsucker	3	W-R	Western Tanager	2	CF
Northern Flicker	11	CF	Spotted Towhee	1	W-R
Western Wood-Pewee	10	CF	Song Sparrow	10	W-R
Willow Flycatcher	8	W-R	Black-headed Grosbeak	4	SH
Eastern Kingbird	<sup>b</sup>	G	Red-winged Blackbird	32	W-R
Warbling Vireo	5	W-R	Brown-headed Cowbird	13	Any
Black-billed Magpie	16	G	Bullock's Oriole	5	W-R
Tree Swallow	13	W-R	House Finch	2	H
Bank Swallow	7	W-R	Pine Siskin	4	CF
Cliff Swallow	10	W-R	American Goldfinch	2	W-R

<sup>a</sup> Habitat codes: Any – generalist, found in all habitats; H – Human dominated areas; OW – Open Water; W-R – Wetland-Riparian; CF – Conifer Forest; SA – Sagebrush; SH – Shrubland; G – Grassland

<sup>b</sup> This species detected only while walking between points